CoSN's 2017 Annual Infrastructure Survey Report

In Partnership with AASA, MDR, and Forecast5

AASA THE SCHOOL SUPERINTENDENTS ASSOCIATION | MDR | FORECAST5 ANALYTICS

CoSN LEADING EDUCATION INNOVATION

Contents

OVERVIEW

CoSN's Infrastructure Survey collects critical information about the connectivity of U.S. K-12 districts. Past survey results have been cited by the Federal Communications Commission (FCC) in their decisions to increase E-rate funding. Since CoSN launched its first Infrastructure Survey five years ago, much has changed—including the name of the survey, which was originally "CoSN's E-Rate and Broadband Survey." While E-Rate and broadband are still integral to the survey, related questions such as Cloud use and security have been added. These additional questions enable us to get a more complete picture of our nation's IT infrastructure and enable districts to benchmark themselves in additional areas. As districts move forward in their digital transition, their technology needs—as well as the technology itself—moves and changes as well. Looking over five years of survey data, helps us to gain insight into how, and how fast, districts' needs have changed over time.

This year's Infrastructure Survey was comprised of 64 questions. Answers were collected in September and October of 2017. The report is based on 445 district responses, with one authorized response per district.[1] Since the specific districts completing the survey vary each year, we cannot provide direct comparisons. However, the survey results provide general indicators into the changes that are taking place in the infrastructures of U.S. school systems.

Metropolitan Status

The metropolitan makeup of respondents is similar to that of prior years. Suburban districts comprise the largest segment with 45%. Rural districts are the next largest segment with 41%. Urban districts comprise only 14% of respondents, meaning they are underrepresented in the results since the federal government classifies 27% of districts as urban. The national balance is roughly evenly split between suburban and rural classifications.[2]

Enrollments

The enrollment demographic of this year's respondents is essentially unchanged from 2016. The largest percentage (42%) of respondents come from small school districts—enrollments less than 2,500—as compared to 41% the prior year. Medium size districts, those with enrollments of 2,500 – 9,999, account for 37% of respondents as compared to 35% in 2016. This year, districts with enrollments of 10,000 or more comprise 21% of the total responses, slightly less than the 24% of the prior year. While these response rates are consistent with prior year surveys and hence provide a fairly consistent snapshot, they do not fully align with general U.S. demographics. Small districts comprise 71% of the nation's school districts, so they are under represented in the survey results. In terms of total U.S. enrollments, however, small districts enroll only 16% of all students.[3]

NOTE:

1 Results have a +/- 4.56 reliability.

2 https://nces.ed.gov/pubs2016/2016076/tables/table_04.asp. Note: the National Center for Education Statistics (NCES) uses four classifications—"city," "suburban," "town," and "rural."

3 State of the K-12 Market 2016-2017: Educational Technology Trends © 2017 Market Data Retrieval

TOP 10 FINDINGS

1. The cost of monthly, recurring ongoing expenses is the most significant barrier to increasing connectivity, for five years running.

2. The vast majority of districts (85%) report that all their schools meet the short-term FCC broadband connectivity goal. There are still 4% of districts where none of their schools meet that goal.

3. Forty-seven percent (47%) of districts have at least some schools meeting the long-term broadband connectivity goal with only a small minority of districts, 16%, achieving the long-term goal in all their schools. For the majority of districts, 53%, none of their schools meet the long-term goal.

4. There is significant progress in lowering the price of broadband in most school districts. For the first time, survey results show less than a tenth of districts are paying $50/Mbps or more for their Internet or WAN.

5. Software as a service (SaaS) is an accepted practice in districts, with 94% of respondents indicating that they use some type of Cloud-based software system.

6. The overwhelming reason why districts are moving to the cloud is to avoid "time-intensive installation/maintenance of software," with 82% of districts indicating that is the case.

7. Rural districts comprise nearly 60% of all districts that receive one or no bids for broadband services.

8. A third of districts (34%) don't use consortia for E-rate purchases even though available—twice as many as last year's 17%.

9. School systems are spending more and more on security – nearly half (45%) spend more than 10 percent of their budget on network security. This marks an increase from 19 percent of school districts in 2016.

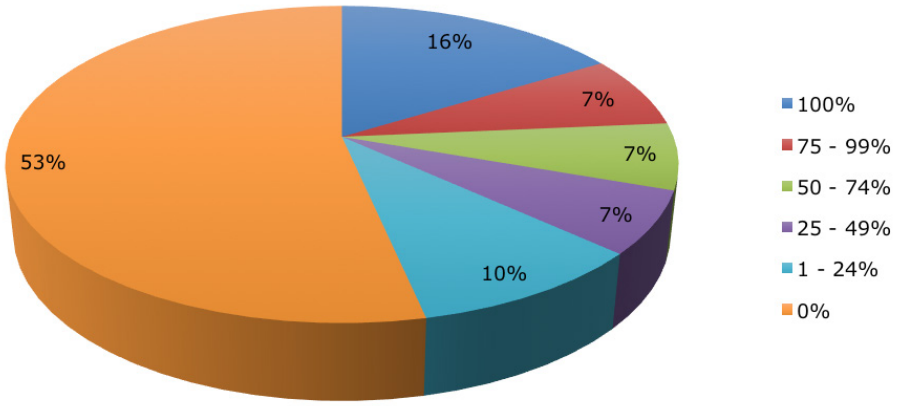
10. More than a third of districts continue to experience one day or more of unplanned network downtime every year. The percentage has remained essentially unchanged since 2014.

SHORT- AND LONG-TERM GOALS

Although impressive gains have been made over the past five years, it is important to highlight that not every district is meeting the FCC short-term national goal of 100 Mbps per 1,000 students. While the vast majority of districts (85%) report that all their schools meet the short-term goal, there are still 4% of districts where none of their schools meet that goal.

When asked about the long-term national goal of 1 Gbps per 1,000 students, a majority (56%) of respondents considered the goal "about right." That said, more than a quarter (26%) of respondents considered the long-term goal as too ambitious. Though 47% of districts have at least some schools meeting the long-term goals, only a small minority of districts, 16%, have achieved the long-term goal in all their schools. For the majority of districts, 53%, none of their schools meet the long-term goal. These results are essentially unchanged from the last years results. This is particularly concerning, as the long-term goal year has arrived.

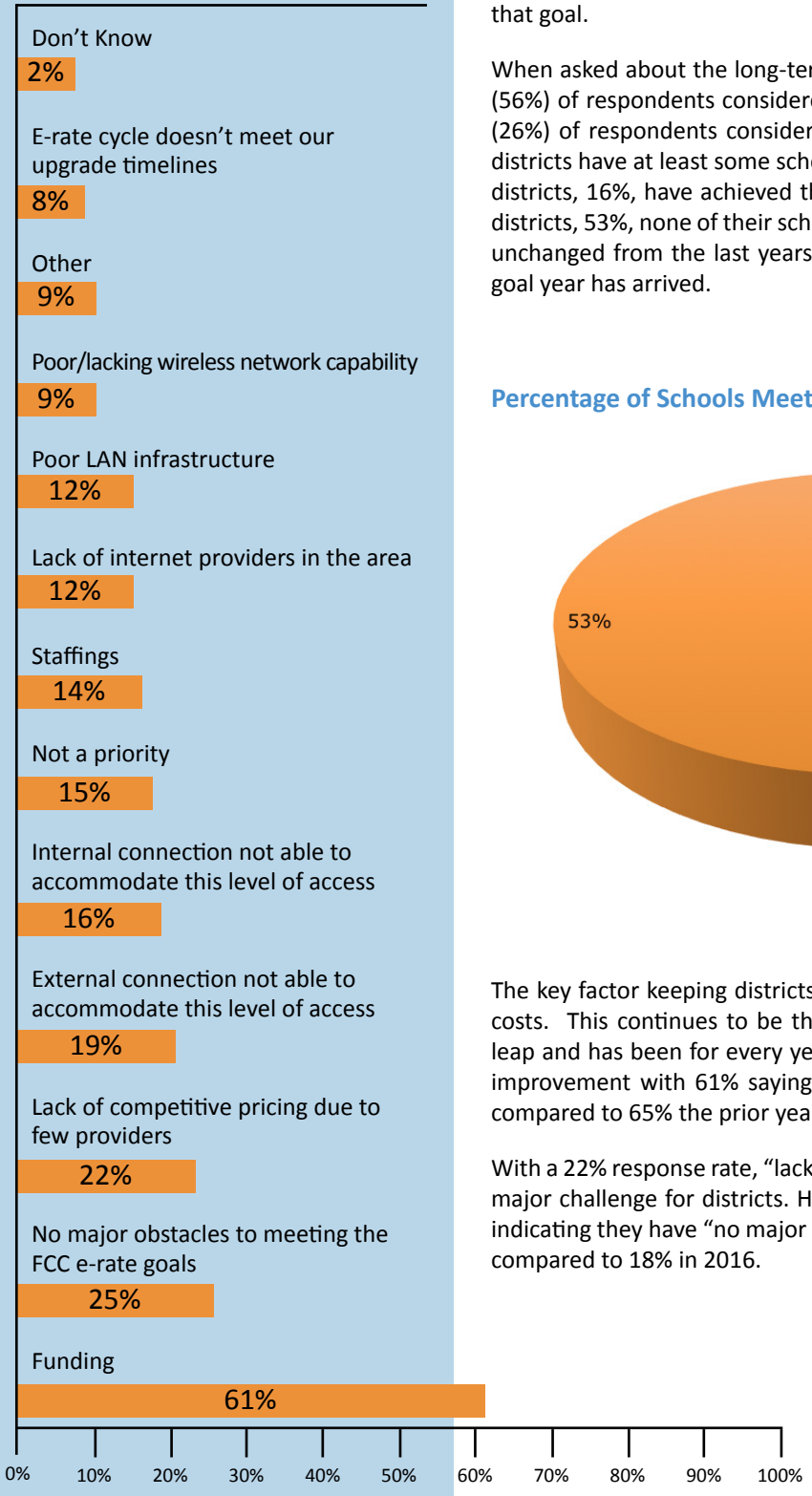
Percentage of Schools Meeting Long-term Goal



The key factor keeping districts from reaching FCC broadband goals is recurring funding costs. This continues to be the main challenge facing school districts making a digital leap and has been for every year since the survey was started. There was some modest improvement with 61% saying recurring funding was the major challenge this year as compared to 65% the prior year.

With a 22% response rate, "lack of competitive pricing due to few providers" is the second major challenge for districts. However, we do see a growing percentage of respondents indicating they have "no major obstacles to meeting the FCC E-rate goals"—25% this year compared to 18% in 2016.

Factors Keeping Districts from the FCC Goals

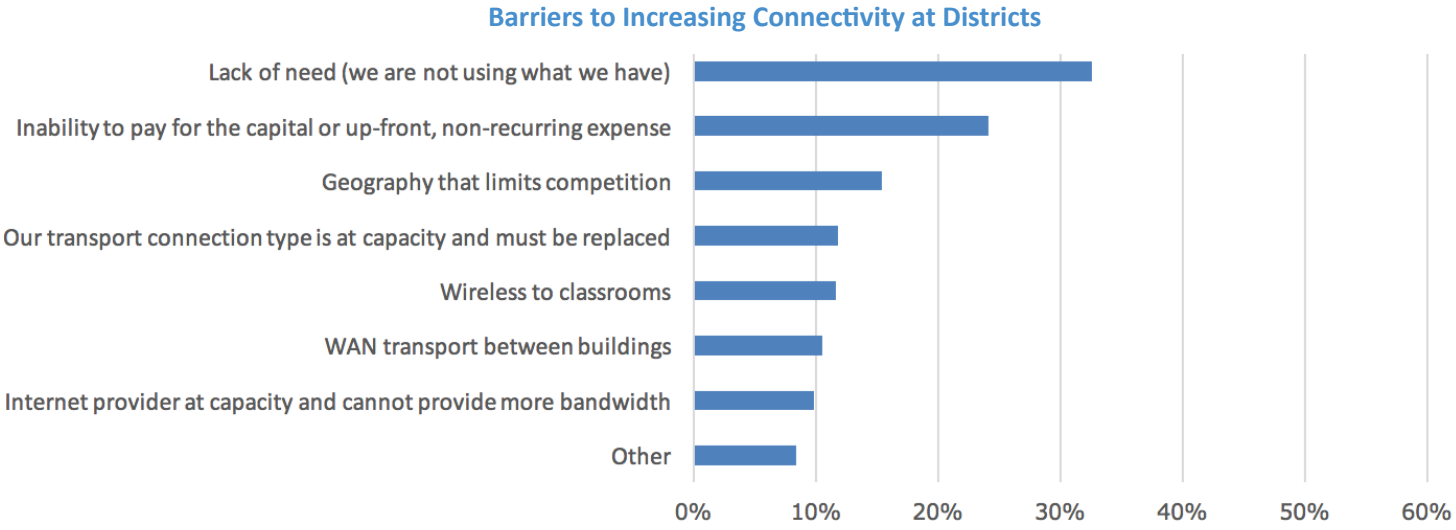


Respondents were asked about upgrades required for specific components to meet the short-term and long-term broadband goals. A large majority of districts report they can meet short-term goals without additional upgrades for every component type. It is a different story for the long-term goals. Relatively large majority of respondents indicated additional upgrades for every component. Internet infrastructure components and firewall, are in the worst shape, each with 71% of respondents needing to upgrade them. DMZ switching, which is used to enhance firewall security, is in the best shape with 56%.

Upgrade required for specific components to meet broadband goals	Yes, we need upgrades for both short-term and long-term	No upgrades are needed for short-term, but we will need long-term upgrades	No upgrades are needed for short-term or long-term	Don't know
Internet Infrastructure Components	21%	50%	27%	2%
Firewall	20%	51%	26%	3%
Content Filter	17%	49%	31%	3%
DMZ Switching	16%	40%	35%	9%
Gateway Routers	16%	47%	32%	5%

COSTS

The cost of monthly, recurring ongoing expenses is, by far, the most significant barrier to increasing connectivity, with 55% identifying this as a challenge.



Costs have been a the most persistent problem for districts since the inception of this survey. Recurring expenses ranked as the top problem every year since 2013 and capital costs (up-front, non-recurring expenses) consistently ranked second or third.

The good news is that "lack of need" has moved up to the number two spot. This likely reflects the 33% of districts reporting they are not using what they already have. By contrast, last year 28% of districts reported having more capacity than they currently use.

Biggest Barrier to Increasing Connectivity	2013	2014	2015	2016	2017
#1	Cost of monthly recurring expenses	Cost of monthly recurring expenses	Cost of monthly recurring expenses	Cost of monthly recurring expenses	Cost of monthly recurring expenses
#2	Cost of capital or up-front non-recurring expenses	Cost of capital or up-front non-recurring expenses	Cost of capital or up-front non-recurring expenses	Cost of capital or up-front non-recurring expenses	Lack of need
#3	Geography	Wireless to Classrooms	Wireless to classrooms	Lack of need	Cost of capital or up-front non-recurring expenses

Student devices now rank the number one driver for Internet bandwidth for the second consecutive year.

Though costs remain the common barrier over the years, the top factor driving the need for bandwidth has changed. Student devices now rank the number one driver for Internet bandwidth for the second consecutive year. Digital content climbed back to the number two slot—the place it held the first time the survey was taken. Since the use of student devices requires digital content, these two drivers will remain closely linked. When this question was first asked on the 2014 survey, "Online Assessments" was the top answer. It was ranked number one the following year as well. Online assessments driving bandwidth growth was no doubt linked to districts' efforts to prepare for the online testing of the Common Core State Standard (CCSS). Several years into that initiative, as more districts successfully met the bandwidth requirements for testing, online assessments is no longer the top driver. This year it dropped to the number three ranking, having fallen to number two last year.

Driving Bandwidth Growth	2014	2015	2016	2017
#1	Online Assessments	Online Assessments	Student Devices	Student Devices
#2	Digital Content	Student Devices	Online Assessments	Digital Content
#3	Student Devices	Digital Content	Digital Content	Online Assessments

A majority of districts (60%) now pay less than $5 per Mbps, a significant improvement from 2016 of 46%.

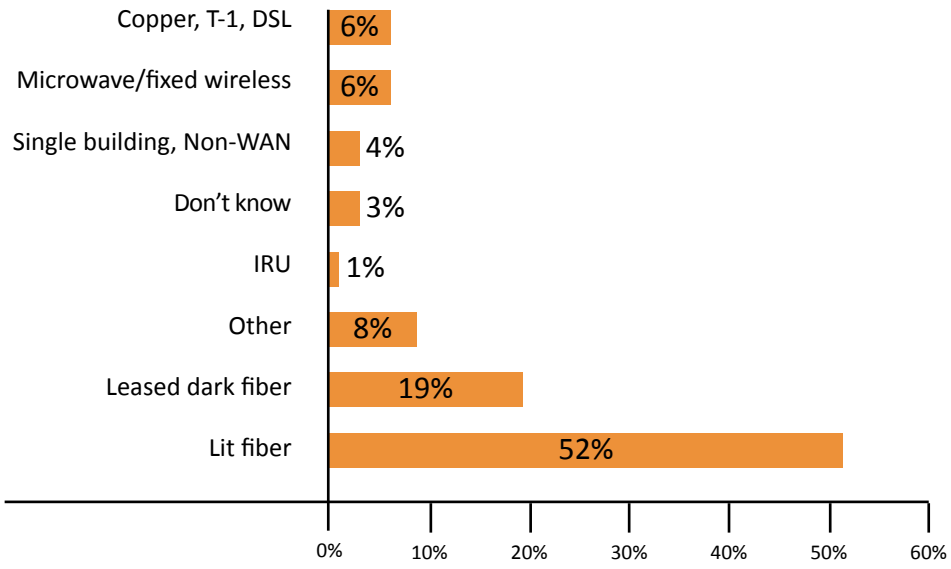
Monthly Mbps costs for both Internet and WAN connections continue to improve. A majority of districts (60%) now pay less than $5 per Mbps, a significant improvement from the prior year of 46%. The most encouraging finding is the decrease of districts paying $50/Mbps or more for either their Internet or WAN connections. Over time, there has been a steady decrease in the percentage of districts paying excessive costs for broadband. For the first time, survey results show less than a tenth of districts are paying $50/Mbps or more for their Internet or WAN.

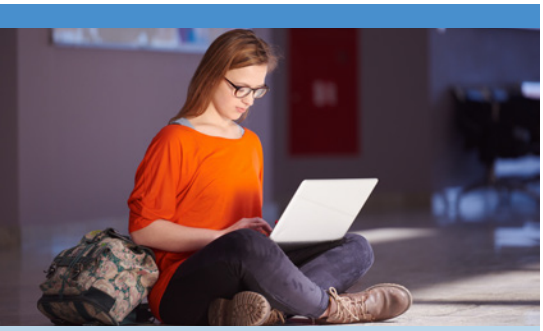
Cost Per Month	Internet Connection				WAN Connection			
	2014	2015	2016	2017	2014	2015	2016	2017
No cost-$4.99/ Mbps	27%	36%	46%	60%	46%	52%	64%	65%
$5.00-$49.99/ Mbps	40%	45%	37%	34%	31%	30%	24%	30%
$50.00/ Mbps or more	32%	19%	16%	6%	22%	18%	13%	5%

Not all columns total 100% due to rounding.

WAN TYPES

With a majority (52%) of respondents using lit fiber for WAN transport, lit fiber holds top ranking, as it has for the past 4 years. Leased dark fiber continues to hold its place as a distant second with 19%. The lag in uptake of leased dark fiber might be explained by the change in fiber eligibility rules (2016) and the time intensive nature of the E-rate process. Although "Other" takes third place with 18%, Copper/T-1/DSL and Microwave/ fixed wireless tie for the next slot with 6% each.





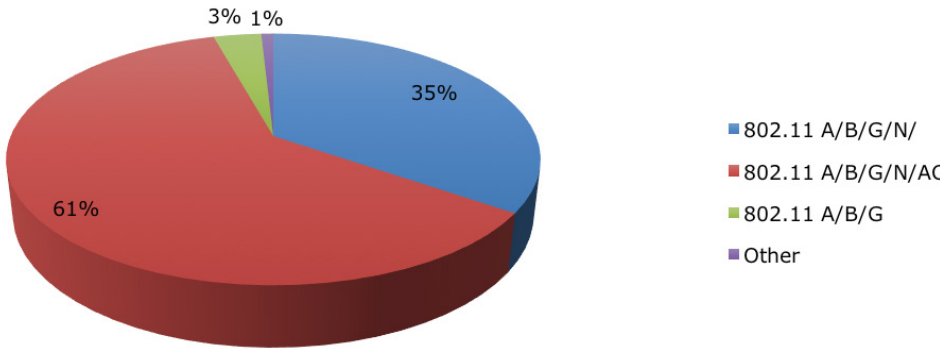
When looking at existing wireless connectivity by school level, high schools (31%) take the lead in their capacity to meet the demand of multiple devices per student.

SPEED

Respondents were asked about the speeds of various types of connections. The typical speed between WAP and LAN switch port is 1 Gbps, accounting for almost three quarters (73%) of all responses. 1 Gbps was also the most popular connection speed between LAN switches and Core switch. However, with 48% of respondents connecting at that speed it was not the majority response rate. The good news is that more than a third of respondents, 36%, report their typical connection is 10 Gbps. Responses were similar for WAN speeds, with 48% reporting that their schools are connected at 1Gbps and 27% reporting 10 Gbps connections. The vast majority of districts (83%) are not using a caching proxy server or WAN acceleration technology. Of those that are, 13% are using proxy servers, 2% use WAN accelerators, and 2% are satisfying their need for speed by using both.

When asked about which standard is used for their WAP, only a small minority (3%) are still using 802.11g, the oldest standard, and about a third of all respondents (35%) are using 802.11n. The majority of respondents (61%) are using the most up-to-date standard —802.11ac—which is three times faster than 802.11n, the previous release of the 802.11 standard.

Standard used for WAP

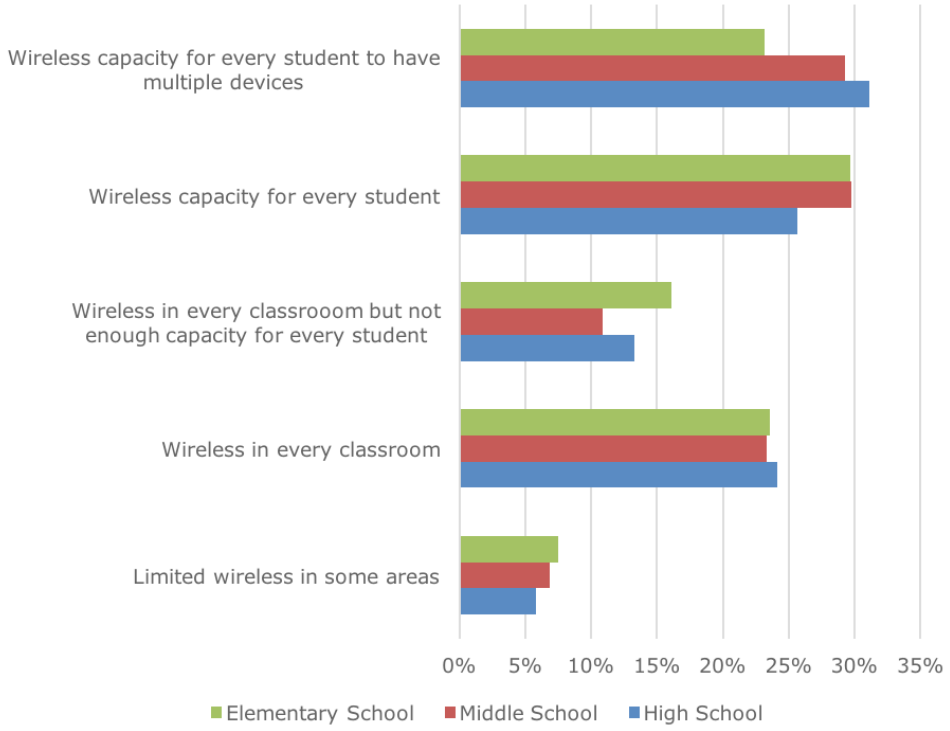


More than half (58%) of respondents report they are “very confident” and 28% report they are “somewhat confident” their wireless networks have the capacity to handle one device per student. This means that an overwhelming majority (86%) of respondents have a reasonable degree of confidence they can handle 1:1 initiatives. This is 5% more than the prior year, and twice the percentage of the 2013 survey results. The first year of the survey, only 43% of respondents were confident their wireless networks had the capacity to handle a 1:1 deployment.

Software as a service (SaaS) is a widely accepted practice with school districts, with 94% of respondents indicating they use some type of Cloud-based software system.

When looking at existing wireless connectivity by school level, high schools (31%) take the lead in their capacity to meet the demand of multiple devices per student. Elementary schools (23%) are least able to have the capacity for multiple devices per student but they are also least likely to have that demand. At the other end of the spectrum—"limited wireless in some areas"—there is virtually no difference between school types. Seven percent (7%) of Elementary Schools and 7% of middle schools have limited access. High schools are at 6%.

Wireless Connectivity of Students by School Level



CLOUD

Software as a service (SaaS) is a widely accepted practice with school districts, with 94% of respondents indicating they use some type of Cloud-based software system. With a 66% response rate, the learning management system (LMS) is the most likely to be Cloud-based. Of respondents that have a Cloud LMS, 27% moved to the Cloud and 39% were "always in the Cloud." Another 14% are in planning stages to move to the Cloud. The overwhelming popularity of Google Classroom might explain the gap between the LMS and the other Cloud-based systems. Only 12% of respondents indicated they don't plan to use a Cloud-based LMS. That is less than half as many (29%) respondents of the next "not planning to move" system—Storage. More than a third of respondents are not planning to move either their Student Information Systems (SIS) or Human Resource System to the Cloud. Thirty-eight percent (38%) of respondents are not planning to move either of those systems to the Cloud. Financial systems are the least likely to be in the Cloud, with a large minority (45%) reporting that they have no plans to move them to the Cloud.

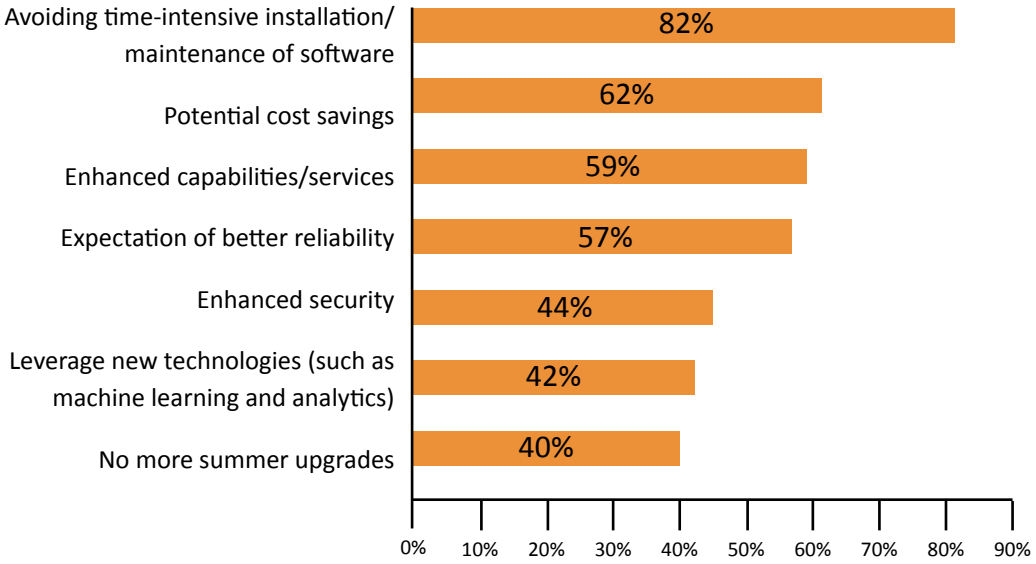
"Avoiding time-intensive installation/ maintenance of software" is overwhelmingly the top reason districts move to the Cloud.

Plans to Move Services to the Cloud

	Not Planning to Move	In Planning Stages	Moved to the Cloud	Always in Cloud	Don't Know
Learning Management System	12%	14%	27%	39%	8%
Student Information System	38%	14%	28%	19%	2%
Storage	29%	34%	30%	4%	2%
Financial Systems	45%	14%	22%	16%	3%
Human Resources Systems	38%	16%	26%	18%	3%

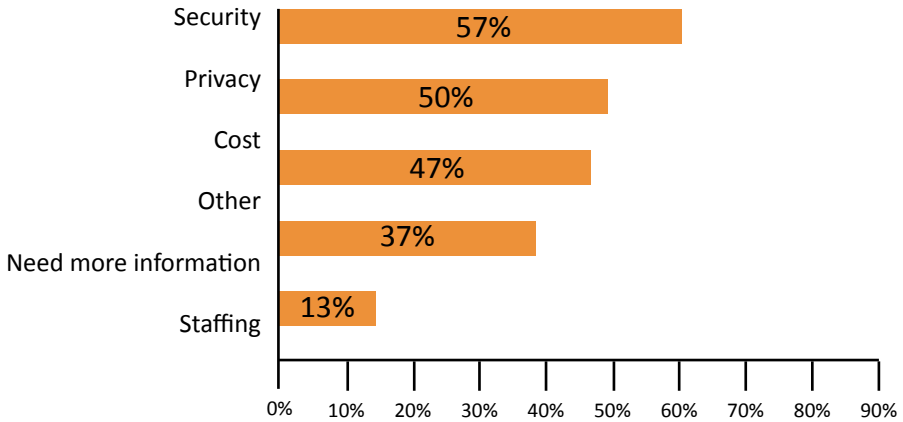
With 82%, "avoiding time-intensive installation/maintenance of software" is overwhelmingly the top reason districts move to the Cloud, followed by potential cost savings with 62% agreement. Avoiding the time-intensive activities not only enables districts to focus on more value-added work, but translates into saving money as well.

Benefits of Moving to the Cloud



For those not moving to the Cloud, Security is the top reason for a majority of respondents (57%) not doing so. Privacy concerns closely follow with 50%. Cost is slightly less of a factor at 47%. More than a third of respondents (37%) are not moving to Cloud because they needed more information before making that decision.

Reasons for Not Moving to the Cloud

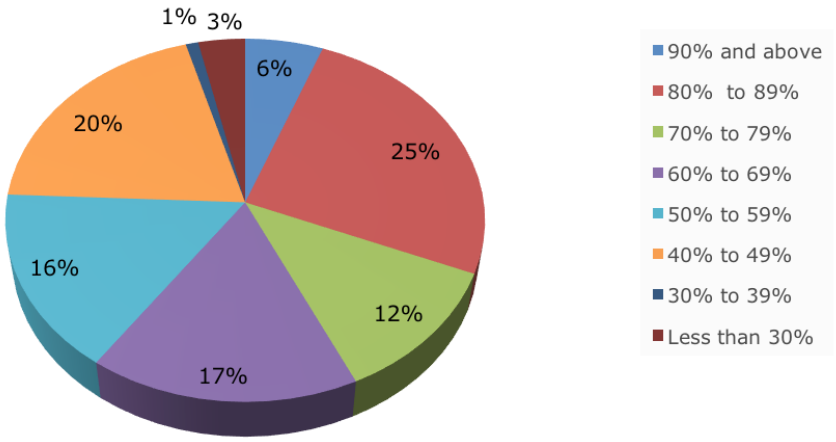


E-rate subsidies are currently being phased out for local and long distance phone services

E-RATE

A quarter of respondents (25%) receive an E-rate discount of 80-89%—the largest segment of responses. The next largest segment, the 40-49% E-rate discount range, accounts for a fifth (20%) of respondents. Only 6% of respondents receive the highest discount (90% and above).

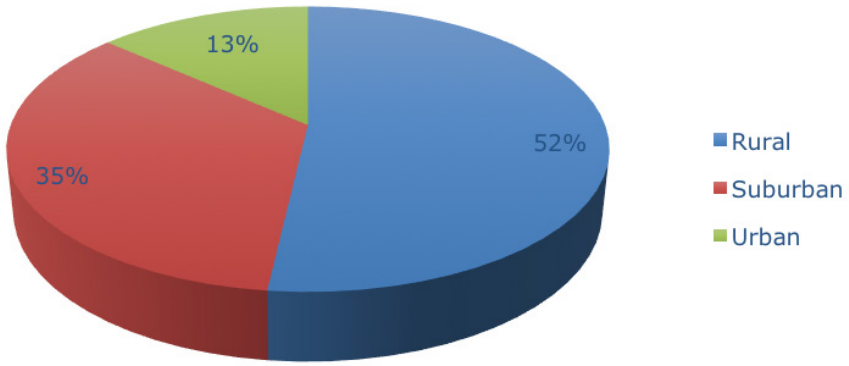
E-rate discount

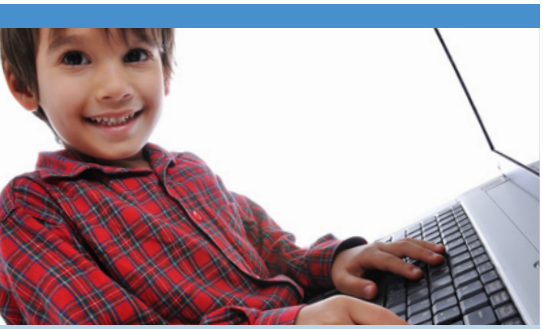


E-rate subsidies are currently being phased out for local and long distance phone services, otherwise known as plain old telephone service (POTS). This phase out includes all voice services—including cellular and Voice over Internet Protocol (VoIP). When asked how this phase out will affect their districts, a quarter responded that their districts do not receive E-rate funding for these services and will not be affected. The majority of respondents (51%) expect some impact but "are already migrating away from POTS services." However, 22% respondents reported the phase out will have a "huge impact" on their districts.

Lack of competition for broadband is a consistent problem for many districts. A large majority of respondents (43%) have only one available Internet provider. Of those districts with only one provider, the majority (52%) are located in rural areas as compared to just 13% in urban districts. (13%) are urban districts.

Percent of respondents with 1 provider

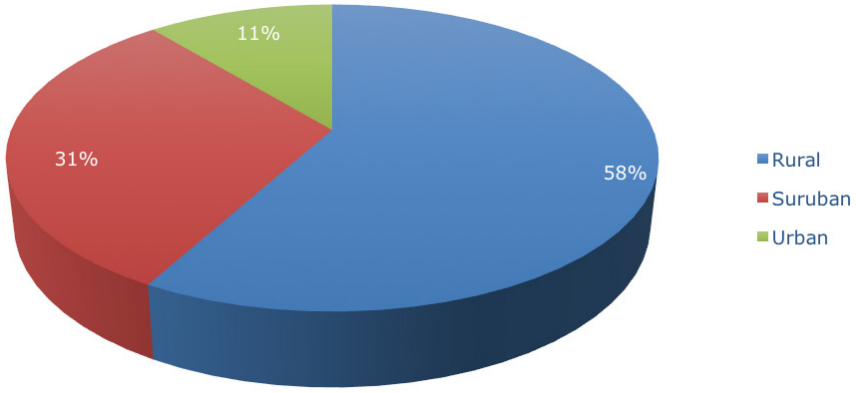




Of the 22% of districts receiving only one or fewer proposals, rural districts are again disproportionately represented, comprising 58%.

The breakdown of respondents receiving Category 1 E-rate proposals from only one or zero providers closely aligns with breakdown for districts with only one provider. Of the 22% of districts receiving only one or fewer proposals, rural districts are again disproportionately represented, comprising 58%. Suburban districts account for 31% and districts in urban areas only 11%.

% of Districts with 0 or 1 Category 1 Providers



Consortia buying can reduce costs and the FCC prioritizes E-rate applications submitted by state and regional consortia. This policy was put into effect as part of the E-rate modernization program in 2014. As shown in the following chart, the policy was initially effective in encouraging districts to use consortia. In 2013 less than half (44%) of districts reported using a consortium for E-rate compared to a majority (60%) of districts which used them the following year after the new policy was in place. However, this year E-rate consortia has essentially returned to the level prior to the modernization project. A third of districts (34%) are not using consortia even though available—twice as many as last year's 17%.

Consortium E-rate Purchasing

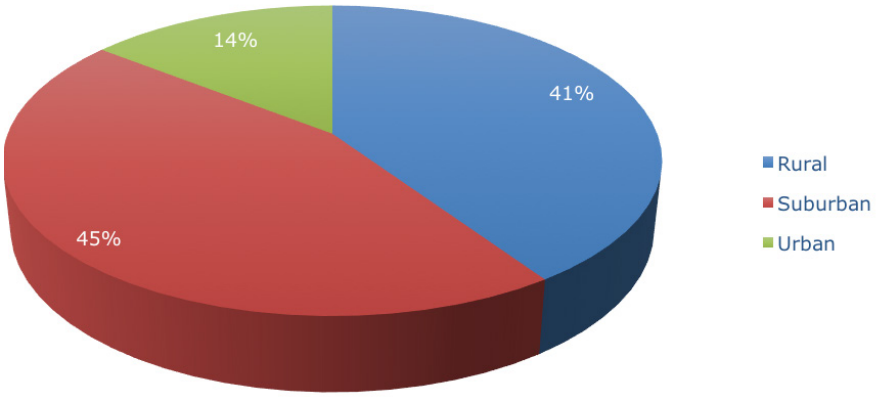
Consortium E-rate Purchasing	2013	2014	2015	2016	2017
Yes	44%	60%	54%	56%	40%
No, Even Though Available	*	11%	20%	17%	34%
Not Available	*	25%	26%	27%	25%
Total Not Participating	56%	36%**	46%	44%	59%***
Other/ Don't Know	*	*	*	4%	*

* Annual survey did not include this breakdown
** Yes/No total does not equal 100% due to "other" category percentages not represented
*** Yes/No total does not equal 100% due to rounding

Districts in urban areas have greater access to consortium buying for E-rate services than their counterparts in other areas.

Districts in urban areas have greater access to consortium buying for E-rate services than their counterparts in other areas. Of the 25% of districts where consortium-buying services are not available to their school system, only 14% are urban. The balance is fairly evenly split between suburban (45%) and rural (41%) districts.

Consortium of Respondents with no Consortium Buying Services



For those districts that do have access to consortia for E-rate purchasing, respondents were asked to indicate the services available through their consortium. Bandwidth/Internet has consistently been the most prevalent E-rate service offered by consortia. The 2014 bandwidth/ internet data reflects the E-rate modernization plan bump.

Consortium E-rate Purchasing

Consortium E-rate Purchasing	2013	2014	2015	2016	2017
Bandwidth/Internet	38%	60%	43%	45%	39%
Access Transport/ Digital Transmission	9%	15%	14%	14%	12%
Equipment	8%	14%	15%	15%	17%
Managed WiFi	*	*	10%	6%	6%
WAN Circuits	*	16%	16%	11%	14%
Statewide Backbone Transport	*	*	16%	14%	10%
Other	6%	*	5%	4%	3%

* Annual survey did not include this breakdown

Devices continue to become more prolific across all levels of schools, with continued progress toward 1:1 or better learning environments.

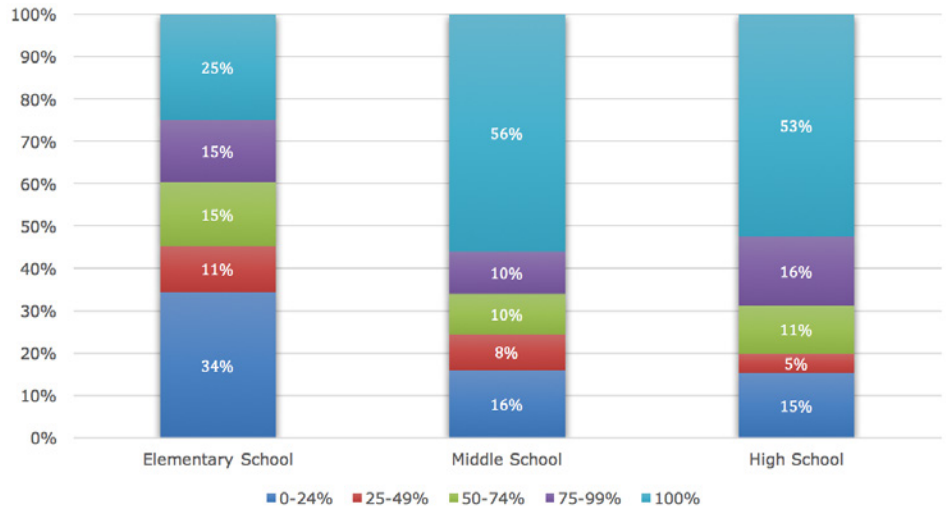
DEVICES & EQUITY

Devices continue to become more prolific across all levels of schools, with continued progress toward 1:1 or better learning environments. Respondents were asked to estimate the average number of devices per student that are used in their districts currently and projecting forward in three years (2020-21 school year). Forty percent (40%) of classrooms today already have a 1:1 device environment. Respondents expect major expansion of shared devices at school in coming years. Students having two devices is expected to grow from the current rate of 18% to 30% in three years. Students having three devices is projected to grow from 1% to 13% over the same period.

Devices Per Student	Today	In Three Years
Less than one device per five students	7%	1%
More than three devices per student	0%	5%
One device per student	40%	43%
One device per two students	33%	7%
Two devices per student	18%	30%
Three devices per student	1%	13%
NA	1%	0%

Student access to non-shared devices at school—via a Bring Your Own Device (BYOD) program or provided by the school—has increased significantly year-over-year. For the first time, more than half of respondents report that 100% of students have access to non-shared devices in a majority of middle and high schools, 56% and 53% respectively. This compares to the prior year when 36% of middle schools and 38% high schools had 100% of their students able to access non-shared devices. Elementary schools have also improved their 1:1 environments, with 25% of districts reporting that 100% of students have access to non-shared devices as compared to 18% the prior year.

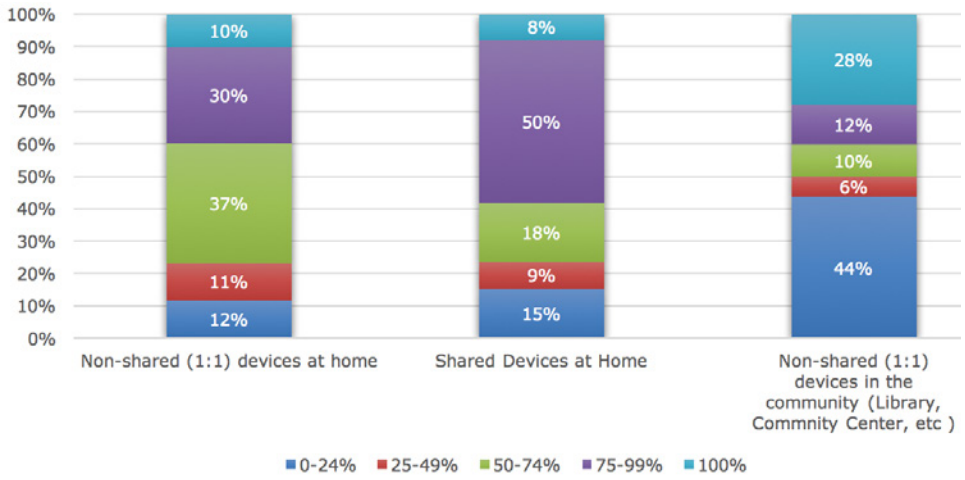
Student Access to Non-Shared (1:1) Devices at School



As districts make the digital leap, students lacking access to digital resources from home are at a disadvantage compared with those who do have access to those resources at home.

The access to devices outside of school is a very different story and is often described as the "homework gap." As districts make the digital leap, students lacking access to digital resources from home are at a disadvantage. The dial hasn't moved very much for student access to non-shared devices outside of school. For the past three years, 10% or less of districts reported that 100% of student have access to non-shared devices at home. Only 8% of districts reported that 100% of their students have access to shared devices at home. There was improvement, however, in student access to devices elsewhere in the community. Twenty-eight percent (28%) of respondents reported that 100% of their students have access to non-shared devices in the community, compared to just 7% the prior year.

Student Access to Devices Outside of School



SECURITY

The Equifax data breach debacle hit the news during the survey response window. Equifax was added to a long and growing list of high profile companies and government agencies that have been hacked. These breaches at large organizations with extensive financial and human resources at their disposal highlight the difficulty in being prepared for cyber attacks. Districts with fewer resources at their disposal are even more challenged to meet security threats. A recent study on network security across business sectors found that "education is the most vulnerable vertical."[4] As this report was being drafted, the U.S. Department of Education issued a cybersecurity alert regarding "a new threat, where the criminals are seeking to extort money from school districts and other educational institutions on the threat of releasing sensitive data from student records."[5] Districts encounter intentional, unauthorized access attempts on a daily basis, as reported by 11% of respondents with another 26% reporting frequent (weekly) or somewhat frequently (every month or so). Only 7% of respondents report "never" being hacked.

NOTES:

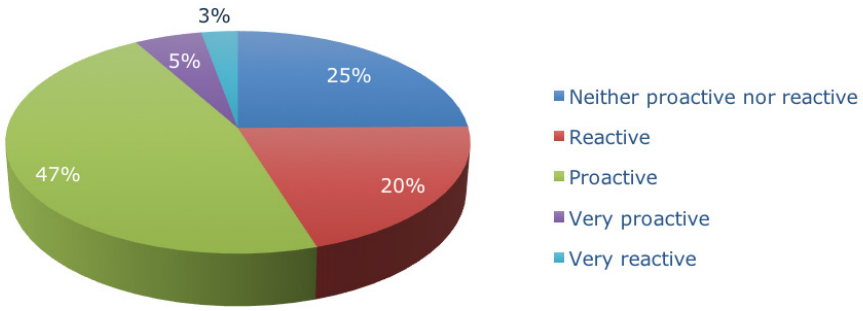
[4] Global Application & Network Security Report 2016-2017, radware https://www.radware.com/assets/0/314/6442478110/01f31b9e-6dfb-49de-86fe-5dd0954bdeac.pdf

[5] https://ifap.ed.gov/eannouncements/101617ALERTCyberAdvisoryNewTypeCyberExtortionThreat.html

Even in this challenging security environment there are practices that districts can implement to mitigate the risk of unauthorized access to their student data.

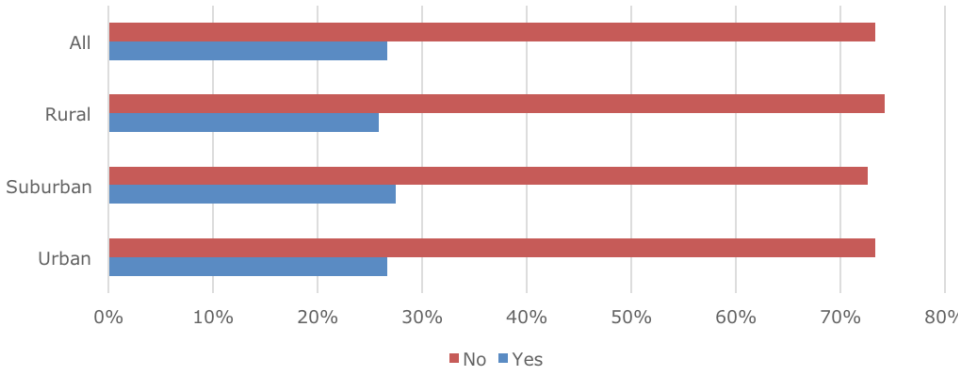
Even in this challenging security environment there are practices that districts can implement—such as staff training and updating software—to mitigate the risk of unauthorized access to their student data. It is not surprising that there was an increase over prior year in the percentage of respondents who reported their school system's network security efforts as either proactive or very proactive. This year a majority of school district respondents, 52%, responded they are proactive compared to 42% last year.

Rating of Network Security



Despite this heightened concern over security, an overwhelming majority (73%) of districts do not have a "dedicated network security person"— the same percentage as the prior year. This lack of a dedicated security person cuts across all districts and is no difference in rural, suburban or urban areas.

% of Districts with Network Security by Metro Status



Respondents without a dedicated network security person were asked in an open text field to explain how they monitor network security. Not surprisingly, virtually all respondents of the open-ended question monitor network security, some use outside services and consultants, others rely solely on software and firewalls. Generally, the responses indicate that districts tend to assign network security as part of the responsibilities of an existing position. The positions most commonly cited as being responsible for security were the network administrator, system engineer, IT director, and technology director, but assistant technology director, technology coordinator, and WAN manager were also identified. Shared responsibility is also common, especially the use of a team approach to monitor security. However many comments included phrases such as "the best we can," "do what we can," "attempt to keep-up," "as time allows" and "one of the many hats." The tone of these comments suggests that many districts are struggling to keep-up with the tasks required to ensure that their networks are safe.

Cyber Insurance

With security breaches and incidents becoming increasingly top of mind for CTOs, many are turning to Cyber Insurance. But what does it take to make sure this is cost effective and actually pays out? CoSN's Cyber Insurance Guidelines, cosn.org/CyberInsurance, provide important information about purchasing insurance. It explains the difference between Cyber Insurance and Breach Insurance coverage and offers advice on:

- Things To Look For
- Things To Expect
- Good Practices
- Questions To Ask

When asked to rate the level of perceived network security risk for five types of attacks, a majority of districts (52%) rated phishing as a high to medium/high risk. It is surprising that phishing was not considered a high risk by *all* districts. Phishing has moved beyond poorly-worded emails from Nigerian princes. The techniques have become quite sophisticated and even security-savvy professionals are being scammed. According to a recent Verizon report, phishing accounts for 90% of all social engineering attacks that lead to incidents and data breaches.[6] It is a popular method used to steal credentials and download malware. Verizon found that "95% of phishing attacks that lead to a breach were followed by some form of software installation."[7] Ransomware was perceived as the second greatest threat, with about a third of respondents (31%) rating it as a high risk or a medium/high risk. An alarming statistic, according to a 2016 report on malware, is that 97% of all phishing attacks deliver some form of ransomware.[8]

Perceived Network Security Threats

	Low Risk	Low/Med Risk	Med Risk	Med/High Risk	High Risk
Network Hack	23%	41%	44%	11%	4%
Phishing	7%	18%	29%	34%	18%
Denial of Service	24%	39%	39%	12%	9%
Identity Theft	18%	39%	38%	15%	8%
Ransomware	15%	30%	39%	22%	9%

Districts should be on high alert and have a strategy for combating phishing attacks. Of the tactics employed, the most popular was "staff training" (34%) followed by "creating an awareness campaign" and "using email security with DNS records," each with 24%. Staff training was also the primary tactic used to prevent data breaches (42%) followed by creating an awareness campaign (24%) and using an application (21%). When asked about their methods to prevent Denial of Service (DoS) attacks, 23% of respondents use an application and 20% are using a mitigation service. Seventeen percent (17%) of respondents do "nothing" to prevent DoS attacks. This relatively high percentage of districts doing nothing roughly correlates with the 24% of respondents who consider DoS to be a low risk.

While software solutions are a key component in a data security strategy, they are insufficient on their own. According to a recent report on endpoint protection, a majority of organizations became victims of ransomware despite using multiple applications to thwart malicious attacks—"The bottom line is even with antivirus, ransomware is going to get in."[9] The most important—and first line of—defense is an educated end-user. So it is good news that awareness campaigns and staff training are the top tactics employed by districts to prevent attacks. However, there is no combination of staff training, awareness campaigns, software, and mitigation services that will bring a district's risk down to zero. Just one failure can compromise a network. So some districts are also purchasing network security insurance. Insurance for data breaches is the most commonly-purchased

NOTES:

6 2017 Data Breach Investigation Report, 10th Edition, Verizon http://www.verizonenterprise.com/verizon-insights-lab/dbir/2017/

7 Ibid

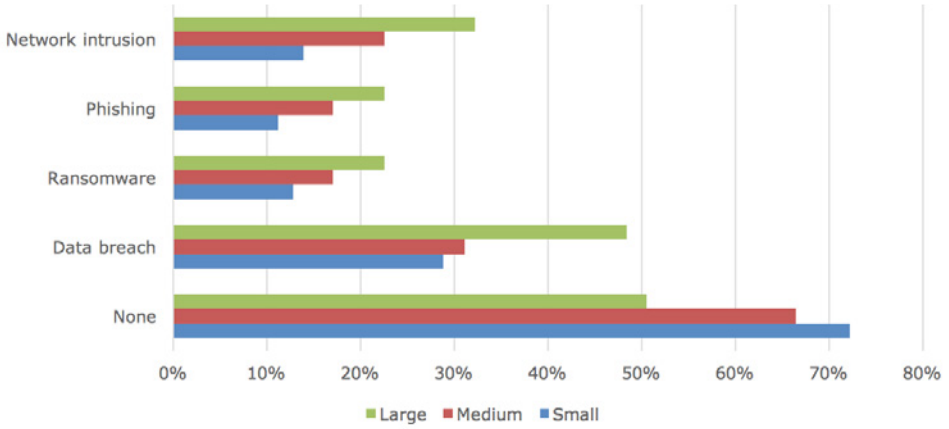
8 PhishMe Inc.'s 2016 Q3 Malware Review https://phishme.com/2016-q3-malware-review/

9 REPORT: The 2017 Endpoint Protection Ransomware Effectiveness Report, KnowBe4 https://www.knowbe4.com/hubfs/Endpoint%20Protection%20Ransomware%20Effectiveness%20Report.pdf?hsCtaTracking=67a14d06-dd12-49c7-8070-93fa017a2729%7C082896ec-48d5-4248-b50b-a38e0076ee1a

According to a recent report on endpoint protection, a majority of organizations became victims of ransomware despite using multiple applications to thwart malicious attacks.

insurance, regardless of the district's size. Small districts (those with enrollments less than 2,500) are least likely to carry insurance, in contrast to large districts (those with enrollments of 10,000 or more), which purchase network security insurance the most.

Security Insurance by Enrollment Size



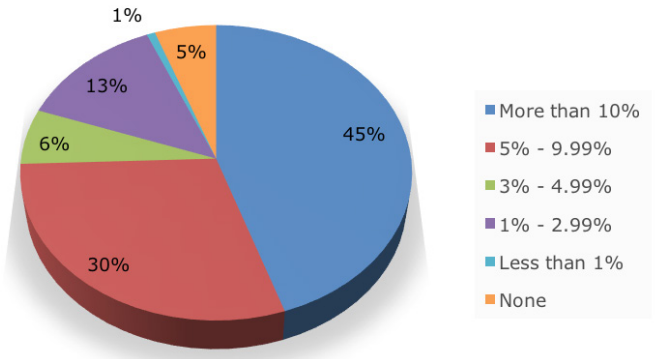
When rating the priority level for various types of cyber security services, breach detection is considered a high priority by a majority of districts (57%), as is security vulnerability assessment services (51%). Only a small minority of respondents considers any of the cyber security services a low priority.

Rating Priority Level of Various Types of Cyber Security Services

	Low Priority	Med Priority	High Priority
Breach Detection	10%	34%	57%
Mitigation Services	12%	45%	43%
Security vulnerability assessment	9%	40%	51%

Five years ago the survey didn't include any questions on network security. This year's survey had 17 questions. This speaks volumes about the rapid growth of concern regarding network security. The concern is also reflected in security budget allocations. In the prior year, 19% of respondents reported spending less than 1% of their technology budget on security. This year, only 1% responded they are spending that low level. Conversely, the percentage of respondents reporting allocations of more than 10% has grown from 19% in 2016 to 45% this year. It is worth restating that staff training and awareness campaigns were the most implemented security precaution methods. It is quite possible that the professional development and communication plans around those campaigns are funded outside the technology budget, which means total allocations for security could be higher.

% of Tech Budget Allocated for Network Security



When asked to rate the impact of various characteristics on their decisions to purchase education technology, the most heavily weighted factor was up-front costs.

PLANNING

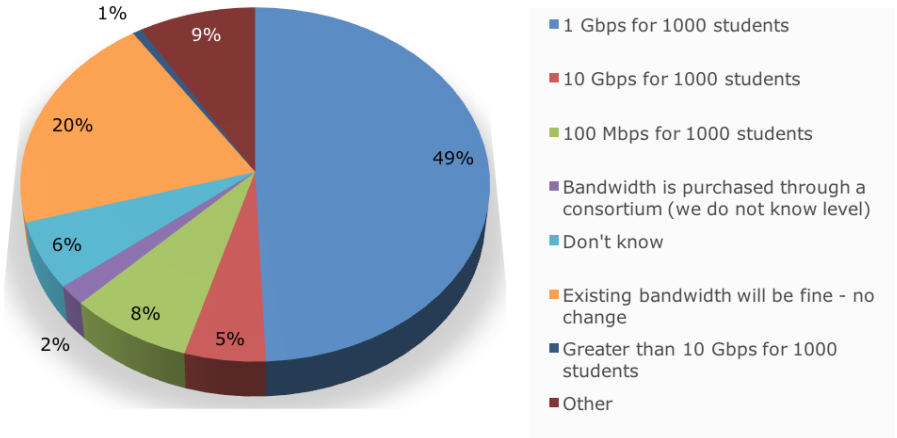
When asked to rate the impact of various characteristics on their decisions to purchase education technology, the most heavily weighted factor was up-front costs, with 64% of respondents reporting that aspect matters "a lot." "Sustainability" was a close second with 62%. Rounding out the top three factors, and the only other characteristic to receive a majority response, is "accessibility for students" (56%). More than a third of all respondents consider scalability and interoperability as key factors, 40% and 36% respectively. Interestingly, the factor least likely to impact purchasing decision is a district's existing Internet bandwidth. However, all factors play a role in purchasing decisions.

Impact of Various Characteristics on Decisions to Purchase Education Technology

	A Lot	Some	A Little	Not At All	Don't Know
Vendor's level of technical support	30%	40%	22%	8%	1%
Existing internet bandwidth	30%	36%	19%	15%	0%
Cyber security	31%	45%	18%	5%	0%
Interoperability	36%	40%	18%	4%	2%
Scalability	40%	43%	13%	3%	1%
Accessibility for students	56%	32%	8%	3%	1%
Sustainability	62%	29%	6%	2%	1%
Up-front cost	64%	28%	6%	1%	0%

1 Gbps for 1,000 students continues to be the goal for the largest percentage of respondents, with a rate of 49% this year. Targets for other speeds are essentially unchanged from prior year. The one notable exception is in the 100 Mbps target, which shrunk from 15% in 2016 to just 8% this year.

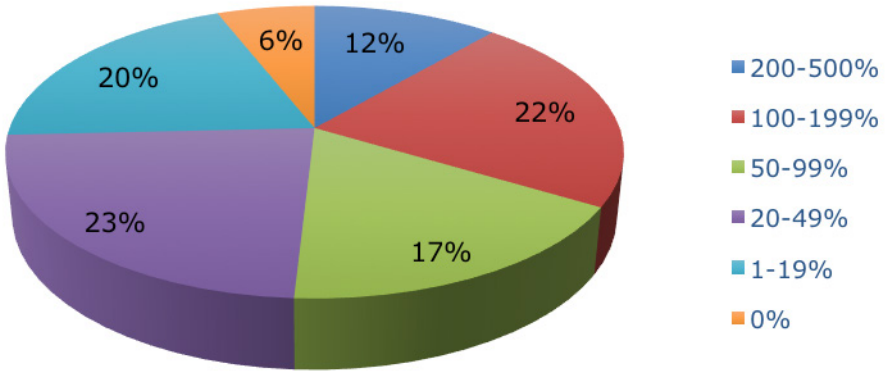
Internet Bandwidth Goals in the Next Three Years (per 1,000 students)



In terms of WAN connectivity growth, 88% of respondents are confident that the growth over the next 18 months will meet the needs of their school systems.

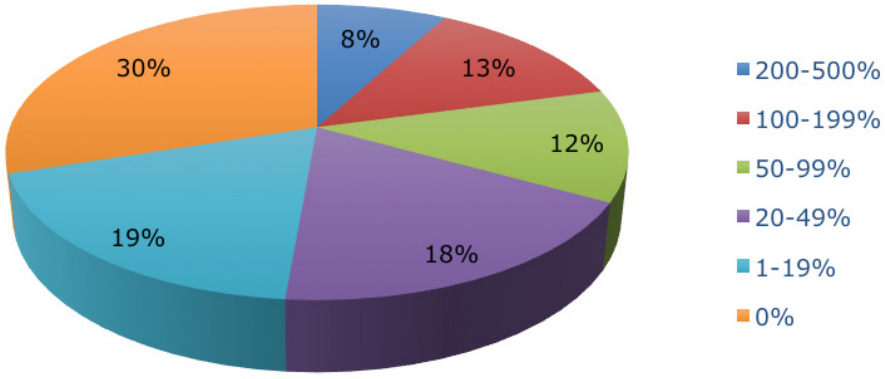
The vast majority of respondents (83%) are confident that their growth in Internet connectivity over the next 18 months will meet the needs of their school systems. Forty-five percent (45%) of respondents project 100-500% growth over the next 18 months. Another seventeen percent (17%) expect Internet connectivity growth of 50- 99%, almost half (49%) expects less than 50%, including 6% not expecting any growth.

Internet Connectivity Growth in the Next 18 Months



In terms of WAN connectivity growth, 88% of respondents are confident that the growth over the next 18 months will meet the needs of their school systems. Growth rates for WAN are substantially less than those reported for Internet connectivity. Only 8% of respondents expect enormous growth rates of 200% or more. The overwhelming majority (67%) anticipate their WAN connectivity will grow by less than 50% over the next 18 months, with almost a third (30%) of respondents projecting no growth.

WAN Growth in the Next 18 Months



A majority (58%) of respondents have no plans to launch "a comprehensive digital planning initiative to expand or update" their current technology plan. Of those that do, a quarter (25%) will be doing so either immediately or within the next 3-6 months. More than a third (39%) of respondents will be launching an initiative during the 2017-18 school year, with 30% planning to do so the following school year of 2018-19. The balance of respondents launching a comprehensive digital planning initiative is waiting until after the 2018-19 school year.

No matter how much districts plan, they need to deal with "unplanned" Internet downtime. Without reliable Internet, Cloud services and digital resources cannot be accessed by teachers, students, or administrators, no matter how solid the other aspects of a district's infrastructure.

Although the demands have changed over the five years, the mission for districts has not —to ensure their classrooms provide a robust teaching and learning environment.

Providers appear to be improving their performance and reducing the down time district experience. Respondents reporting Internet downtime of three days has steadily decreased from a high of 29% in 2014 to just 18% this year. The number of districts reporting extended downtime beyond 30 days dropped to zero this year, from 4% in 2014. Unfortunately, more than a third of districts continue to experience one day of downtime every year. The percentage has remained essentially unchanged, ranging from 39% in 2014 to a low of 36% in 2015. This year the rate is 37%.

CONCLUSION

Connectivity and network demands have steadily increased since the first annual CoSN Infrastructure Survey five years ago. 1:1 deployment is no longer a promising district pilot program but becoming the standard learning environment. Districts are no longer concerned just with school connectivity but with their students' access to devices and Internet at home for learning. Five years of survey results show that there is no end in sight for the need for more bandwidth. With the move to Cloud-based systems, increased use of online content and assessments, and the proliferation of mobile devices, districts struggle to continually evolve their network infrastructure to keep up. Although the demands have changed over the five years, the mission for districts has not —to ensure their classrooms provide a robust teaching and learning environment.

ABOUT CoSN & SURVEY PARTNERS

CoSN is the premier professional association for school system technology leaders and represents over ten million students nationwide. The mission of CoSN is to empower educational leaders to leverage technology to realize engaging learning environments. Visit cosn.org or call 866-267-0874 to find out more about CoSN's focus areas, annual conference and events, advocacy and policy, membership, and the CETL™ certification exam.

AASA, The School Superintendents Association, founded in 1865, is the professional organization for more than 13,000 educational leaders in the United States and throughout the world. AASA advocates for the highest quality public education for all students, and develops and supports school system leaders.

MDR is a full-service school and community engagement partner. A division of Dun & Bradstreet, MDR is a different kind of integrated marketing services agency that combines rich data with unique digital, creative, and branding capabilities. We've been connecting brands through data and marketing services to educators, youth and parents for nearly 50 years. Reach targeted audiences through our database and digital communities SchoolData, WeAreTeachers, WeAreParents and School Leaders Now.

Forecast5 Analytics provides interactive data analytics solutions to schools covering a spectrum of organizational performance areas. The Forecast5 platform includes cloud-based business intelligence software, an analytics platform that connects a district's disparate student datasets into one system, a financial forecasting engine, interactive data visualizations and a Google Maps-based tool for geospatial projects. More than 1,200 school districts across the country are using Forecast5 tools to maximize their data insights.

Survey Report Author:

Paula Maylahn, an education industry consultant with over 30 years' experience across the K-20 spectrum, prepared this report. Paula is a contributing author on two books, "The Experts' Guide to the K-12 Market" and "The Experts' Guide to the Postsecondary Market", and has penned the "Enterprise Systems" chapter of recent editions of the "State of the K-12 Market." Paula is a member of CoSN's Standards and Technical Committee, a former board member of the Education Division of the Software & Information Industry Association, and former Executive Council member of the PreK-12 Learning Group of the Association of American Publishers.

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